U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE

HEARING CHARTER

The 2004 Presidential Awardees for Excellence in Mathematics and Science Teaching

Thursday, April 14, 2005
10:00 a.m. - Noon
2318 Rayburn House Office Building

1. Purpose

On Thursday, April 14, 2005, House Committee on Science will hold its annual hearing to hear from teachers on how the federal government can help improve K-12 math and science education. Five elementary school math and science teachers will testify before the Committee. They are in town this week to receive the 2004 Presidential Award for Excellence in Mathematics and Science Teaching, the Nation's highest commendation for K-12 math and science educators. At the conclusion of the formal hearing process, the other awardees, who will also be in attendance at the hearing, will be given the opportunity to make brief statements on the subject of K-12 math and science education. Their comments will be entered into the official hearing record.

2. Witnesses

Joyce Dodd teaches sixth grade mathematics at Bryson Middle School in Simpsonville, SC. Ms. Dodd has more than 30 years of teaching experience.

Cynthia Cliche (rhymes with fish) teaches first grade mathematics at Homer Pittard Campus School in Murfreesboro, TN. Ms. Cliché is also a college level Math Methods instructor for Middle Tennessee State University. Ms. Cliche has more than 20 years of teaching experience.

Cassandra Barnes teaches third grade mathematics at Oregon Trail Elementary School in Clackamas, OR. Ms. Barnes has 10 years of teaching experience.

Lonna Sanderson teaches third grade science at Will Davis Elementary School in Austin, TX. Ms. Sanderson is a National Board Certified Teacher with more than 30 years of teaching experience.

Pita Martinez-McDonald teaches fourth grade science at Cuba Elementary School in Cuba, NM. Ms. Martinez-McDonald has more than 30 years of teaching experience.

3. Background

On April 26, 1983, a blue-ribbon commission appointed by the Reagan Administration released "A Nation at Risk," a report containing strong language and disturbing findings on the state of education in the U.S. In one of its more memorable lines, the report stated, "If any unfriendly foreign power had attempted to impose on America the mediocre education performance that exists today, we might well have viewed it as an act of war." Included among the "indicators of risk" were international comparisons of student achievement, which revealed that U.S. students were never first or second on any of 19 different academic tests, and they scored in last place in seven of them. National assessments also showed a steady decline in science achievement scores of U.S. 17 year-olds.

Today, U.S., educators, researchers, policymakers and the general public use the National Assessment of Educational Progress (NAEP), a congressionally-mandated project of the National Center for Education Statistics at the U.S. Department of Education (ED), to determine what students know and can do in various subject areas. While NAEP does not, and is not designed to, report on the performance of individual students, it does compare student achievement in states and other jurisdictions and track changes in the achievement of fourth-, eighth-, and twelfth-graders over time in mathematics, reading, writing, science, and other content areas.

In mathematics, the 2003 NAEP results (the latest report available) found the performance of fourth and eighth graders increased steadily from 1990 to 2003, and the average scores in 2003 were higher than in all previous assessments. More encouraging, some of the lowest-performing students made the greatest improvements. The proportion of African-American and Hispanic fourth graders reaching the basic achievement level—the level of minimum competency—in mathematics rose from 36 to 54 percent and 42 to 62 percent respectively. It was also notable that these achievements occurred while higher-scoring students also made gains, although at a somewhat slower rate.

This represents real progress, but many U.S. students are still not proficient in mathematics. While the 2003 NAEP showed an increase in the proportion of students reaching the proficient level, only 32 percent in grade four and 29 percent in grade eight were able to do so and even smaller proportions were able to reach the advanced levels. In addition, while the 2003 NAEP did not assess students in grade 12, the 2000 NAEP found that 35 percent of twelfth graders were below the basic achievement level in mathematics, reinforcing the concern that achievement falters as students progress from middle school to high school.

In science, the 2000 NAEP (the latest report available) showed that the average scores of fourth and eighth graders were essentially unchanged from 1996 while the scores for twelfth graders declined by three points – a significant decline. Specifically, in 2000, only 29 percent of fourth graders scored proficient or better as did 32 percent of eighth graders and 18 percent of twelfth graders. Worse, scores for American Indian students in eight grade and white students in twelfth grade fell from 1996 to 2000.

For a comparative perspective on education in the U.S. and in other industrialized nations, the U.S. uses the Trends in International Mathematics and Science Study (TIMSS), an assessment given every four years, to provide participating nations with information on their students' understanding of math and science. The 2003 TIMSS, issued in December 2004, showed that the absolute scores of U.S. fourth and eighth grade students improved. However, while the relative rank of U.S. eighth graders improved, the rank of fourth graders dropped. U.S. students performed in the middle ranks of students in mathematics (in which students from about 35 nations were tested), and somewhat higher in science (in which students from about 15 nations were tested). U.S. students did not lead in any category.

The 2003 TIMSS did not assess 12th graders but another international assessment, the Program for International Student Achievement (PISA), showed American 15 year-olds performing below the international average in mathematics literacy and problem-solving.

While U.S. undergraduate and graduate education remains the envy of the world, the interest of, and the participation by U.S. students in science, technology, engineering and math is declining. In fact, 25 – 30 percent of entering freshmen express an interest in science and engineering, but less than half complete a science or engineering degree in five years. As the number of U.S. science and engineering students declines, our dependence on foreign students grows. According to NSF's *Science and Engineering Indicators* (2002), the percentage of foreign-born individuals among scientists and engineers in the U.S. is growing at all degree levels, in all sectors, and in most fields. Especially high percentages are found in engineering (45 percent), computer sciences (43 percent) and mathematics (30 percent).

Issues in K-12 Education

Over the years, education research and successful reform initiatives have underscored the importance of having a qualified teacher. Yet, in response to impending teacher shortages, particularly in mathematics and science, many states have allowed individuals without the appropriate background to teach. In fact, the Department of Education's 2004 "Condition of Education" report found that 49 percent of seventh grade mathematics teachers did not have the equivalent of a minor in mathematics, and that 32 percent of middle school science teachers did not have the equivalent of a minor in any of the sciences. Not surprising, high school students in high minority and high poverty public schools fared even worse with more science and mathematics courses taught by out-of-field teachers.

A related problem is the exodus of new teachers from the profession, with more than 30 percent leaving within five years. High teacher turnover creates a continual demand for new teachers, and those teachers require teacher professional education and development. Partly as a result, many schools are moving toward the regulation of teaching practice, such as the use of more scripted curriculum materials—a change that may limit some able teachers from exercising their professional knowledge and discretion, making teaching less inviting to those most qualified.

To achieve the twin goals of improving education and narrowing the achievement gap, *No Child Left Behind*—President Bush's comprehensive K-12 education law—requires a "highly qualified" teacher in every classroom, it raises the qualifications of paraprofessionals (also known as teacher aides) and it requires public reporting of staff qualifications. It also provides state grants to recruit and train teachers.

At its center, *No Child Left Behind* seeks to hold schools accountable for the progress of their students by requiring annual testing for all students in grades 3 – 8 in reading and math and by ensuring that all students make "annual yearly progress" toward proficiency in these subjects, the prime measure of success under the law. Failure to do so results in a school being identified as "needing improvement," which triggers various interventions, such as choices for parents and corrective actions. In addition, states are required to have academic-content standards in place for science by the 2005-2006 school year and, beginning in 2007-2008, states will also have to test in science at least once in each of the 3-5, 6-9 and 10-12 grade spans. But science test results will not be counted as a factor in determining whether a school or district is making adequate yearly progress unless states voluntarily decide to impose that step.

While many have credited the new law with the improvement in student achievement on national and international assessments, others have complained that the reliance on testing has resulted in "teaching to the test" and "dumbing down the curriculum." In addition, while the science requirements under *No Child Left Behind* have placed a renewed emphasis on the subject, including the design of new tests and the reform of science courses to align them to state standards, many believe that the more immediate pressures in reading and mathematics will keep science at the margins of education.

National Science Foundation (NSF) K-12 Education Programs

Math and Science Partnership Program

No Child Left Behind also called for the creation of a new Math and Science Partnership Program at NSF to bring together higher education, school systems and businesses. Ultimately, Congress created two complementary programs: one at NSF and one at ED. The NSF program awards grants on a peer-reviewed, competitive basis to partnerships between institutions of higher education and one or more school districts to improve math and science education. Funds are used to develop innovative reform programs that, if proven successful, would be the key to large-scale reform at the state level. The ED program allocates funding on the basis of population and poverty to all 50 states, which then compete the funding to math and science partnerships at the local level.

The Administration's fiscal year 2005 (FY05) budget attempted to zero out the NSF program and transfer the remaining $120 million to ED. The Science Committee opposed the move in its FY05 Views and Estimates. In relevant part, the Committee stated:

> The Committee is especially troubled by the proposal to eliminate the NSF's Math and Science Partnership Program. This program was specifically authorized as part of the *National Science Foundation Authorization Act of 2002*. The Committee strongly believes that NSF is the only federal agency with a proven record of selecting education projects that offer the best hope to narrow the achievement gap and raise student performance in math and science. Through its competitive, merit-based process, NSF is uniquely qualified to use its decades of experience in education research and evaluation to appraise grant proposals and to strengthen the link between research findings and classroom practice. The Partnerships program should be funded at the authorized level of $200 million.

This transfer was ultimately rejected by the Congress. While the President's FY06 budget request did not renew the call for the transfer, it requested only $80 million to meet existing obligations under the NSF program. Further, the request increased funding for the ED program and made clear that no new NSF grants would be awarded in FY06.

Elementary, Secondary and Informal Education

NSF also sponsors a number of other programs through its Division of Elementary, Secondary, and Informal Education that are designed to improve preK-12 science, technology, engineering and mathematics education. Some, such as the Instructional Materials Development Program, are designed to develop and disseminate instructional materials and assessments. Others, like the Informal Science Education Program, are designed to promote learning outside the classroom, including through the media, museum exhibits and community-based organizations. Total funding for Elementary, Secondary and Informal Education at NSF—a division of the Education and Human Resources Directorate—total approximately $181 million in FY05. The President's FY06 budget request provides only $141 million. The committee expressed its concern in its FY06 Views and Estimates. In part:

> The Committee is especially disturbed by the proposed cuts in NSF's Education and Human Resources (EHR) Directorate. Since 1950, NSF has been tasked with strengthening math and science education programs at all levels. Yet under the budget proposal, the overall investment in education at NSF would drop from $841.4 million in FY05 to $737 million in FY06 (down 12 percent). Much of the decrease would occur in the Elementary, Secondary, and Informal Education (ESIE) account, which would drop from $182 million to $141 million….NSF's education programs are unique in their capacity to develop new and improved materials and assessments, create better teacher training techniques and move promising ideas from research to practice. The Committee fears that disinvestments in this area will deprive states, school districts and schools of the tools and ideas they need to achieve the goals of the *No Child Left Behind Act*. NSF's EHR programs should receive at least level funding in FY06.

Presidential Award for Excellence in Mathematics and Science Teaching

In 1983, President Reagan signed into a law a program establishing the Presidential Award for Excellence in Mathematics and Science Teaching to identify outstanding science and mathematics teachers in kindergarten through 12th grade. The program, which is administered by NSF, identifies outstanding science and mathematics teachers, kindergarten through 12th grade, in each state. These teachers are to serve as models for their colleagues and will be leaders in the improvement of science and mathematics education. In fact, since 1983 over 3,000 teachers have been selected to enter the network of Presidential Awardees. While most have remained in the classroom, some have become school principals, supervisors, superintendents and college faculty.

Recognition is given to K-12 teachers in four award groups: (l) elementary mathematics, (2) elementary science, (3) secondary mathematics, and (4) secondary science, with the secondary groups including middle, junior, and senior high school teachers. The award now alternates yearly by grade level. This year, the award will recognize teachers of grades K-6, with one elementary math and one elementary science awardee from each state.

Teachers applying for the award must be nominated. Anyone may nominate a teacher (self-nominations, however, are not accepted), and then a state selection committee chooses three finalists from each award group for recognition at the state level. A national selection committee, comprising prominent mathematicians, scientists and educators, reviews the state-level finalists and makes award recommendations to NSF and the President. Each award includes a $10,000 award from the NSF for the recipient's school and a Presidential citation. In addition, awardees are invited to attend an award ceremony and other Washington recognition events, including meetings with leaders in government and education.

4. Questions for Witnesses

The panelists were asked to address the following questions in their testimony before the Committee:

- Based on the involvement you have had with federal math and science programs, what are the most important and effective components of these programs?

- What are the factors that limit the performance of students and teachers in math and science? What is the single, most important step that the federal government should take to improve math and science education?

- What elements of your pre-service or in-service training have been most helpful in meeting the daily demands of working with students, developing innovative classroom strategies and delivering content rich instruction to a diverse group of students?